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Translation.

Artificial Insemination of Mammals.

SCIENTIFIC AND ZOOTECHNICAL METHOD*.

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Artificial insemination of the mammals is said to have been practised in the first instance by the Italian scientist, Spallanzani, a convinced partisan of the anti-spermatic school, which attributed the fertilising power not to the spermatozoids, but to the liquid part of the sperm.

Only a few years ago this problem did not attract any serious attention from biologists, members of the medical profession and zootechnicians, and was considered as having no importance both from theoretical and practical standpoints. The majority of the treatises and textbooks (biological, medical and zootechnical) allotted to this question a few lines at most; more frequently this subject was passed over in silence, or the inutility of the research in this direction was just pointed out.

Amongst the various motives for this purely sceptical attitude, it was alleged that the method in question involved the revision of the most difficult moral and social problems (CHROBÆ, ROSTHORN) Zootechnical and veterinary literature, with few exceptions (Prof. HEAPE, for example) did not attach any importance to the method of artificial insemination. It was admitted that in combating sterility in mares one could resort in certain cases to the injection of sperm in the cervix of the uterus, as a corollary to natural coitus. Certain facts cited in favour of this method were not exempt from serious objections owing to the lack of control. Experiments were conducted under ordinary conditions which did not give any guarantee against the possibilities of natural conception. These objections greatly increased since certain communications by gynæcologists (especially of the French school) appeared in the press claiming success for the artificial insemination of women who were supposed to have attained the stage of normal sterility. A scandalous story of a limited company, "Do Vitam," which tried to exploit artificial insemination for its own enrichment and for the blackmailing of their clients; the law suit instituted afterwards by the patients and their husbands; the decision of the Faculty of Medicine annulling a thesis on artificial insemination in women, which was written in rather a frivolous manner and conceived in the same spirit (and in spite of that approved by a professor); and lastly the Papal Bull (1897) condemning irrevocably all ideas of the possibility of artificial fecundation in women and prohibiting anyone to engage in the pursuit of this immoral question—all these facts necessarily give birth to certain prejudices against this problem, not only among the general public, but even amongst the specialists.

Such was the situation at the moment when, 30 years ago, we started to work on this problem in the course of our researches on the physiological rôle of the internal secretion of the auxiliary sexual glands, at the Institute of Experimental Medicine, in St. Petersburg.

STEINACH'S experiments on rats have established that after elimination of the seminal vesicles the males preserved their ability to cover the females, but the percentage of females fertilised diminished perceptibly. If at the same time the prostate was extirpated, sexual instinct and coital aptitude remained intact, but the males so operated upon have become completely sterile. These facts led Steinach to the conclusion that the spermatozoids of the mammals were deprived of fertilising power in the absence of the secretion of the auxiliary sexual glands. This conclusion was confirmed, with certain reservations, by CAMUS and GLEY, who experimented on guinea pigs. Starting with the idea that the sterility of the males operated upon in the experiments of these scientists resulted from purely mechanical causes (impeding the penetration of the spermatozoids in the genital organs of the female) but not from certain specific properties of the secretion of the auxiliary glands, we undertook experiments of artificial insemination with the spermatozoids obtained from the epididymus, placing them in an artificial medium, free from any admixture of the secretion of the auxiliary glands. Experiments were conducted on rabbits, guinea pigs and dogs, and had given positive results. Thus for the first time was established the fact of artificial insemination in mammals with the spermatozoids preserved *in the artificial medium*, that is to say with the "*artificial sperm.*" The hypothesis attributing the specific rôle of the secretion of the auxiliary glands in the process of fecundation was thus defeated. It was possible to demonstrate later on that the spermatozoids could remain active for a long time and preserve their fertilising power in a testicle detached from the animal or even taken from a slaughtered animal. If the operation was made aseptically and the testicles afterwards placed in a sterilised glass receptacle and maintained at the temperature of 2° C., spermatozoids could preserve their fertilising power up to 8 days. Experiments of this kind were conducted on rats, guinea pigs, dogs, horses and cattle.

This method of artificial insemination with the "artificial sperm" has relatively limited practical application. It is of practical importance in cases of severe wounds or mutilations or the sudden death of a valuable sire (that is to say, if the death was caused traumatically but not by infection). It allows utilisation of the reproductive

* Authorised translation by Henry Fox, D.V.SC. (Kharkov), M.R.C.V.S.

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faculty of certain animals which have become too heavy and inactive for natural coitus and are eventually sent to the slaughter house (bulls, boars, etc.).

This method may render very valuable services in the experiments of hybridisation, when it is impossible to obtain the necessary male alive; the male in this case can be killed, castrated and its genital glands utilised afterwards. In 1928 Mr. Gorbounow (Chief of the International Expedition for the Study of High Pamir), acting on our suggestions, carried out, according to our plan, experiments of hybridisation between domesticated sheep and a species of wild ram (*Ovis Poli*). On account of the extraordinary agility and cautiousness of the animals, also owing to the difficult natural conditions of the country, it was almost impossible to take the wild adult rams (which sometimes weighed 240 klgs.) alive. The only means of obtaining a cross between this species and domestic sheep was artificial insemination with spermatozoids received from killed animals. These experiments have great importance both from the scientific standpoint (especially with reference to the rather obscure question of the origin of domestic sheep) and the practical, the possibility of creating a new meat-producing breed. It is too early yet to express an opinion on the results obtained. As the test ewes have not been strictly isolated from the test domesticated rams, we have certain doubts as to the genuineness of the progeny. One must wait until the young develop the horns, which is one of the most reliable means for ascertaining the origin.

The method of insemination with the " artificial sperm " is actually used on a large scale in laboratory practice when one has to deal with animals from which it is difficult to obtain natural sperm (mice, rats and other small laboratory animals).

As regards artificial insemination in domestic animals with the aid of natural sperm, one of the reasons which caused the abandonment of this method and made it unpopular was the existence of a certain number of scientific and practical problems, so far unsolved, pertaining to the rather imperfect technique; this immediately narrowed the sphere of its application, confining it to the cases dealing with sterility in horses only.

Artificial insemination permitted the experimental control of the influence exercised on the progeny by the spermatozoids subjected to the action of this or that agent; it opened the road for practising on a large scale cross-breeding of the species which do not interbreed in natural conditions by reason of differences in height, weight, etc. With appropriate technique one could obtain sperm in sufficient quantities. It has become possible to study in detail the chemical composition and the physiological state of the seminal liquid of different animals—a thing up to the present absolutely unknown—and to ascertain the influence of this or that factor on the quantity or quality of sperm. It has become possible to study equally in detail the mechanism (up to the present unknown) of the secretion of sperm in mammals, etc. If the technique conditions permitted insemination of 5 to 10 females with the sperm obtained from one male without diminishing the percentage of conception; if it were proved that artificial insemination was not injurious to the health of the mother or of the progeny; if the latter were found afterwards quite normal as far as vitality, reproductive faculty and working ability were concerned; if the expenses for the installation necessary for practising artificial insemination were compensated by the advantages obtained—this method certainly could play a very important part in the utilisation of the valuable sires and dams and the improvement on a large scale of the races of domestic animals. This is of paramount importance for the countries which suffer from the lack of blood stock, as always was the case with Russia.

Artificial insemination must, we believe, be of help not only in combating sterility, but in serving as a prophylactic method of unique efficiency in fighting diseases transmitted through the genital organs (dourine, infectious abortion, infectious vaginitis, etc.).

If it were possible to preserve spermatozoids in the active state and capable of fertilisation in the natural sperm during two or three days, the transportation of sperm for large distances would become feasible. The solution of this problem has an enormous importance for the organisation of reproduction in domestic animals. It would simplify it, would diminish the running expenses and would increase the returns. The introduction of artificial insemination in common practice would place it under the control of the microscope, taking it out of the hands of the incompetent person (herdsman, cowman, etc.) and placing it under the control of veterinary surgeons and Zootechnicians. In order to solve all these problems and cast the light on its various possibilities, it was necessary to conduct a preparatory experimental work; only after this was accomplished, would the practical application become possible.

Those responsible for the administration of the State Studs in Russia had become interested in these questions and gave us the opportunity of organising a small laboratory and an experimental station where we devised a technique of artificial insemination applicable not only in horses, but in all domestic animals and where, during five years, we conducted experiments and made observations. This preparatory experimental work (in the course of which, besides laboratory animals, more than 550 horses were subjected to observation and experiments) enabled us to form the following conclusions:—

Our technique, as applied in a great number of various animals, has enabled us to obtain seminal liquid *in toto*. The procedure employed for its collection and injection was very simple and offered (if all technical instructions were observed) no danger to the health of the female. The sperm collected at one time from the horse, the bull, the boar, was sufficient on an average for inseminating 10 or 15 females. A stallion produced on average 100 c.c. of sperm and sometimes 300 c.c. and more.

The percentage of conceptions, far from being inferior to that observed after natural copulation, generally speaking, was superior; with the stud horses, if the condition of the females was normal and the reproductive power of the male high, the percentage was from 75 per cent. to 80 per cent.

Pregnancy pursued its normal course, the progeny did not differ in any way from that brought forth after natural copulation; puberty arrived at normal time and the capacity for work was beyond doubt.

Injection in the cervix of the uterus gave a larger percentage of conceptions than insemination in the vagina.

Artificial insemination was practised only at a very characteristic period of heat. Insemination which was not made during this period led to conception only in exceptional cases. It is necessary to inject freshly collected sperm because the spermatozoids of the horse usually preserve their fertilising power in the secretions of the auxiliary sexual glands for two to four hours only. Contrary to what was supposed (Professor Hoffman and others) it is useless to maintain the sperm at the bodily temperature (36° to 37° C.); the spermatozoids of the natural sperm die at this temperature more rapidly than at a temperature of 12°-18° C., or even at 2° C. The use of the sperm diluted with a saline solution gave certain results, but the percentage of conceptions was much lower than with the undiluted sperm.

It was only after this experimental work was carried out that the method of artificial insemination was proposed for use in the State and private stud farms and at the breeding stations. A laboratory for this special purpose was established with a branch in the renowned Zoological Park "Ascania Nova." This laboratory had for its aim not only the scientific study of the biology of reproduction but also the preparation of specialists for the practical application of this method in the field.

From 1910 to 1914 about 400 veterinary surgeons passed through our laboratory; out of those about 100 applied our method in the country districts. Artificial insemination was introduced at the breeding stations as an experiment; veterinary surgeons were not officially instructed as to the technique of its application; the work lacked unity; the mistakes and the useless complications sometimes introduced into the technique could but negatively contribute towards success. Nevertheless, where the work was conducted in a regular fashion, the percentage of positive results approached the figures indicated above. In certain studs (Provalsky, Kœnig and others) it went up to 90 per cent. During this period over 7,000 horses at least were subjected to artificial insemination. The network of breeding stations, more dense in the Southern Russia and in the Volga districts, extended from the extreme west of Russia in Europe to the Far East (Irkoutsk, Blagoveschesk a Amour, Kharbine). This vast practice of artificial insemination in horses attracted attention abroad. Germany, Austria, Rumania, also the United States of America and Japan, have clearly manifested their interest in our work and these countries either sent us specialists to study our methods or bought the necessary instruments. The Great War at first, then the Revolution and the Civil War which followed, had retarded the progress of this work for nearly 10 years. It was only in 1923 that it was possible to resume the interrupted work. Artificial insemination alleviated a pressing need (caused by the dearth of valuable pedigree sires) for the improvement of live stock. It was resolved in the first instance to increase the activities at the breeding stations. The progress in the practical application of this method in Russia is illustrated by the following official figures:—

In 1923,	the	number	of	mares	inseminated was about 1,000
,, 1924,	,,	,,	,,	,,	2,500
,, 1925,	,,	,,	,,	,,	8,500
,, 1926,	,,	,,	,,	,,	18,000
,, 1927,	,,	,,	,,	,,	44,000
,, 1928,	,,	,,	,,	,,	70,000

The figure for 1929 is not known yet, but it has been estimated that 250,000 horses will be inseminated. In 1930, 714 breeding stations will be at work. In view of such rapid extension the results obtained were not always good, on account of the difficulty in supplying the necessary number of specialists. However, breeding stations and the studs which possessed the necessary equipment and material and had a sufficient number of specialists, have obtained better results. The number of mares inseminated in the course of a season with the sperm obtained from one stallion exceeded sometimes four hundred; in certain districts it was necessary to double the number of stallions at the breeding stations in order to satisfy the demand from the peasants. Unfortunately, organisation was far from being satisfactory and in many breeding centres the results were far from what could be desired. In the studs our method was generally used in combating sterility in mares. At the breeding stations the work is being done by veterinary surgeons, who receive a special training. Scientific and research technique are being developed by the Biology of Reproduction Department of the State Institute of Veterinary Experimental Medicine. The rest of the work and also the provision of the necessary credits is incumbent upon the Chief Administration of the State Studs, which is one of the departments of the Ministry of Agriculture. At the majority of breeding stations artificial insemination of the mares is done free of charge.

In the localities affected or menaced by dourine they resort to artificial insemination in accordance with the conclusions and the research work which was carried out in collaboration with Professor Mesnil. A mare, known to be healthy, serves for obtaining the sperm; thus one avoids the danger of infecting a noted sire after copulation with an unknown mare brought from afar, and also the transmission and propagation of contagion is precluded; a suspected mare, or those in the first stages of the disease, are inseminated separately; the progeny of these is free from trypanosomes. In that way it became possible

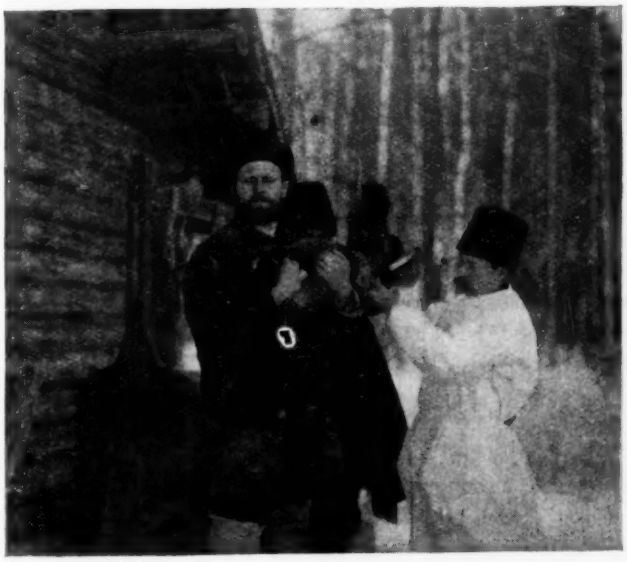

Fig. I.—Artificial Insemination of Sheep in Northern Caucasus.

Injection of the Ram's Sperm, with the Aid of the Syringe, Through Professor Iwanow's Speculum.

to utilise the pedigree stallions belonging to State Studs for serving the mares owned by peasants.

Apart from horses, we have utilised the method of artificial insemination for sheep and cattle, but on a lesser scale. This depends on the brevity of the period of heat in these animals and the difficulty of transporting them to the breeding stations. At the big State farms and collective farms, which have thousands of head of cattle and sheep, this method is receiving vast application. The work with the sheep has already been commenced on a large scale. Last year artificial insemination was practised on five thousand sheep in Northern Caucasus, our aim being to obtain a cross between the indigenous sheep with

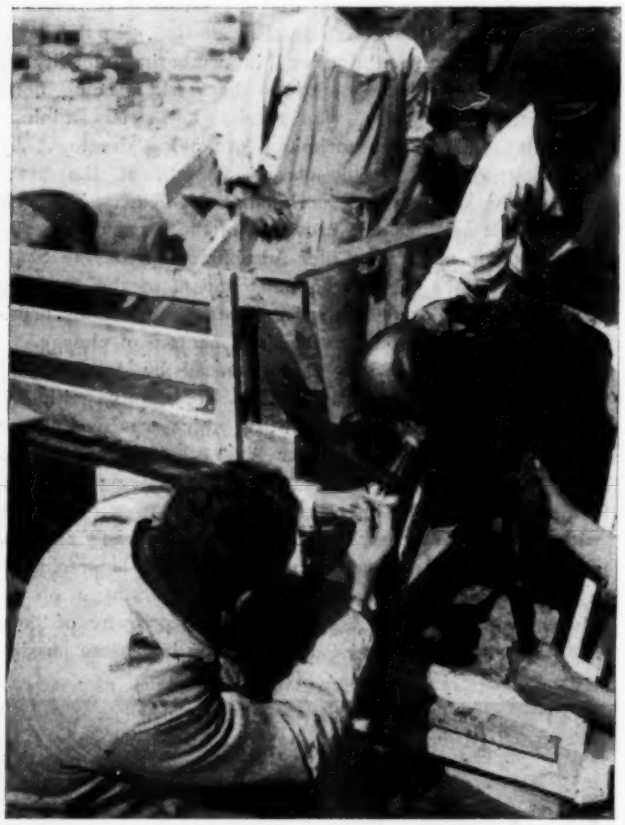

Fig. II.—Artificial Insemination of Silver Fox at Bologuë (Northern Russia).

coarse wool and the merino-sheep; despite certain unfavourable local conditions, the results obtained were quite satisfactory from the point of view of number and quality of the progeny.

Artificial insemination in sows is very simple; quantity and quality of the progeny do not differ in any way from others brought forth by natural insemination. Artificial insemination presents a particular interest and notable economic advantages if applied to the fur-bearing animals (silver foxes). Foxes are monogamous animals and at the fur farms the necessity of keeping one male for each female increases overhead charges. By artificial insemination one male fox can serve from 10 to 20 females at least. The obtaining of sperm even from very ferocious foxes offers no difficulty.

Apart from domesticated mammals, we have perfected a method for the artificial insemination of birds. The spermatozoids (obtained from the ductus deferens), either pure or diluted in saline solution, are injected in that part of the oviduct which opens into the cloaca. Artificial insemination of Queen Bees offers considerable interest, not only for the selection of drones and the maintaining of the parity of the race, but it is of equal importance when obtaining a new object and especially in researches on genetics. This problem has received a definite solution in the works of the American biologist, Watson.

This method would appear to be applicable now to all species of domestic animals; it has numerous applications in all branches of animal husbandry; it allows the more effective and more efficient utilisation of valuable sires, and is of help in improving breeds; it is useful in combating sterility, and is a prophylactic method in fighting against the propagation of the diseases of the generative organs. It is necessary to note the importance of this method for cross breeding between different species of domestic animals; mules, zebroids, hybrids between cattle and the zebu, yack, auroch, bison and others. These cross-breds are of considerable interest from the standpoint of genetics and possess properties valuable for the agriculturist.

It was established with certainty that the mule (cross between he-ass and mare) possesses greater longevity as compared with his parents; he preserves the ability to work hard until 30 years of age and over; he is not particular about his food, is very hardy and possesses remarkable resistance to a number of diseases (as noted by Sanson). The mule is a unique animal for transport in mountains.

The remarkable resistance to piroplasmosis of the hybrids between the cattle and the zebu (*Bos indicus*), as compared with cattle, leaves no doubt whatsoever; in the same way, African cattle having a mixture of zebu blood, show greater resistance against trypanosomiasis.

We worked extensively before the War on the question of the hybridisation of domestic animals in the Zoo Park "Ascania Nova" (which still exists) where we had a branch laboratory. The strength of zebroids was measured by dynamometres and by burdens carried; it was established that they were much stronger than horses of corresponding weight and height.

The hybrid of the bison and the cow (Ukrainian) surpasses in strength and endurance the ordinary (Ukrainian) ox. The hybrids between the auroch and the bison, on the one part, and the cattle, on the other part, possess greater weight and height than the parent forms. The breeding of the hybrids of domestic animals is destined to receive a vast field of application. A method of artificial insemination which, with a comparatively small number of males, affects the work of hybridisation on a large scale and with a great economy of means, and, which is still more important, economy of time, cannot fail to become of great utility in the near future.

In Russia before the War breeding of mules with the aid of artificial insemination was practised at the stud farm of Kœnig and others. The zebroids were, as has been mentioned already, bred at Ascania Nova.

Passing now to the rôle which artificial insemination has played in widening our knowledge of the biology of the

seminal cells and of the physiology of the sexual phenomena in mammals, we will endeavour to outline this very briefly and will dwell only on essential facts.

Before the introduction of this method the sperm of animals was very little known and studied; its exterior aspect, its physical properties, its chemical constitution were unknown. The work of Professor Slovtzoff, who received material in litres from our laboratory, was the first which gave detailed chemical analyses of the seminal liquid of the horse and dog; hitherto only the analysis of human sperm was made. The works of Gabriel Bertrand, who studied the sperm of the horse, demonstrated the importance of detailed knowledge of its chemical composition. It is from our laboratory that the first description was issued of the exterior aspect, and of the composition, of the sperm of various species of domestic animals; also of other closely related wild species (zebra, bison, auroch and Prjevalsky horse) and their hybrids. Specific gravity, freezing point, electrical conductivity of the sperm of the dog, horse and the ass were first studied and described in our laboratory. We have studied the influence of sexual regime, exercise and diet on the quantity and quality of sperm. It was established that at the moment of ejaculation, the various auxiliary glands do not work synchronically but in a certain order, which agrees with the observations of Broesike in the case of man. It was established that quantitative and qualitative modifications of the sperm, of its liquid part and of spermatozoids, are closely dependent on the presence or absence of sexual excitement, etc. We have evolved methods for obtaining in a pure state the secretion of the auxiliary sexual glands in horses and dogs. Biological peculiarities of some of these secretions were noted—of the prostate, for example, which secretion has the property of exciting the motive energy of spermatozoids and which at the same time might constitute the medium in which they die very rapidly.

It was proved beyond doubt that the secretions of auxiliary glands serve to dilute the mechanically-spermatic mass, which arrives in comparatively small quantities from the ductus deferens in the *pars prostatica urethræ* in the first instance, and to assure the escape of spermatozoids from the latter into the genital organs of the female afterwards. It was ascertained that in horses ejaculation is not always completed during coitus; sometimes one finds, instead of complete sperm, only the secretions of the urethral and Cowper glands without spermatozoids. It is very important to know this fact, in connection with the practice on stud farms, and this circumstance was totally unknown hitherto. The method of artificial insemination is indispensable in the experiments of hybridisation. We have utilised this method on a large scale, trying to obtain crosses between sheep and goat, dog and fox, rabbit and hare, and we have arrived at the definite conclusion that such hybrids *cannot* be produced. Artificial insemination was particularly useful in our researches on the fecundity of hybrids between zebra and the horse, between cattle and the bison and auroch and also the latter with the bison. Artificial insemination made possible the research work carried on not only in our laboratory but also at Cambridge, at Professor Marshall's Institute, and in Japan, at the school of Professor Ischikawa, etc., bearing on the biology of the seminal cells in mammals with special reference to their resistance, their vitality, and their aptitude to transmit to the progeny traces of nocuous influences imparted by the action of different poisons, saline solutions, toxins, alcohol, salvarsan, neosalvarsan, atoxyl, etc., also on the action of the sun-rays, ultra-violet rays and radium, modifications of the osmotic pressure, pH, etc.

The question of the possibility of exercising (in mammals) an influence on the progeny through the intermediation of the parental seminal cell, has received, in the course of our experiments, an answer identical with that obtained by Herbst (1906) after his experiments on the sea-urchins, and by Ernst Gellhorn (1924) who experimented on frogs. Whatever are the nocuous influences to which the seminal cell is subjected in the course of its functional activity, it follows the rule " all or nothing." If spermatozoids subjected to this or that nocuous action preserve the power to fertilise the female cell, one gets a normal progeny, or the embryo perishes in the initial stages of pregnancy. In our experiments, where sperm used in artificial insemination was preliminarily treated by alcohol, salvarsan, neosalvarsan, atoxyl, etc., we could not notice any anomalies in the progeny, notwithstanding the fact that the quantity of alcohol added to the sperm reached sometimes 8 per cent., and that the concentration or neosalvarsan added was sufficient to deprive the trypanosomes (*Tr. equiperdum*) of their infective power. Rabbits, guinea pigs, dogs, sheep, born under these conditions, lived in the laboratory quite a long time and were used for reproduction. In our experiments (less numerous, it is true) on the sperm (of mammals) subjected to the action of radium, we have never obtained, contrary to what was observed by Oscar Hertwig on frogs, and Müller and his pupils on the Drosophiles, any progeny, in spite of the energetic mobility of the spermatozoids.

These facts give us the right to say that neither changes in temperature (within a certain range) nor exposure to the diffused sun-rays (if spermatozoids are subjected to these processes during artificial insemination) produce any weakening or anomalies in the progeny. There were only one or two monstrous foals delivered in tens of thousands of births recorded after artificial insemination. On the contrary, there were dozens of noted racing and trotting champions born in the studs where artificial insemination was practised. Our hope to solve effectively the problem of " sterilisation of sperm " is based mainly on our knowledge of these facts. As far as " *artificial sperm* " infected with the *Tr. equiperdum* is concerned, we have obtained positive results during our experiments; but with the *natural sperm* this problem will have to be solved.

We must pass over the whole series of new and valuable observations on the seminal cells of mammals (in their relation to the problem of artificial insemination). We will only say that biological research on the spermatozoids of mammals, particularly on the influence of modifications of pH in the " medium " (to which attention has been drawn for the first time by Dr. Wolf, Cambridge) will enable us to solve (if not definitely) in principle, at least, the problem of long distance transport of sperm. This is of paramount importance from a practical standpoint.

Experiments in the transportation of horse sperm by aeroplane will be inaugurated in Russia next Spring.

It remains to state here that artificial insemination must become, in the hands of genetists, a new instrument for

the rapid determination of "genotype" in the course of work on mammals in general and on our domesticated animals in particular.

We can now answer the question in what degree the method of artificial insemination is directly applicable in men.

This method, after successful experiments on animals, was unequivocally recognised by gynæcologists as a means of combating sterility in women. One can hardly deny the possibility of utilising artificial insemination, in the more or less distant future, with a view of improving the human race on a large scale. Everything will depend on conditions of life, on the evolution of our ideas, on the relations between the sexes, on the rights and duties of an individual in relation to collective bodies, etc. We know that even now the right to procreate is restricted by law in certain countries. In certain States of the U.S.A. and in one Swiss Canton, the compulsory sterilization of lunatics and defectives is prescribed*.

[* Professor Iwanow concludes his interesting paper with the statement that he has commenced experiments designed to verify the degree of relationship between man and the anthropoid apes.—Ed.]

A Reuter's message from Belgrade says that King Alexander has signed the Bill for the encouragement of stock-rearing on scientific lines, which was formulated by experts on the basis of the most recent experiments in this direction.

"A recent visitor to London, after an absence of three or four years, is reported to have said that there are hundreds more horses on the streets of the Metropolis to-day than there were then. One cannot speak as to hundreds, but there certainly appear to be as many horses on the streets as there were as any time since the War," says the *Scottish Farmer*.

Spiller's Quarterly Journal.—A seasonable example of the enterprise characteristic of the firm of Spiller's, Limited, is to hand in the special Xmas and New Year Number of their sprightly publication. Information and fun are cleverly blended from cover to cover, while the pages are enlivened with a capital selection of illustrations which will appeal to all dog owners.

New Method for Ascertaining Death.—A freshly prepared re-agent is made by adding saturated aqueous solution of sodium persulphate to a 2 per cent. solution of methylene blue until it is completely decolourised, avoiding excess of the persulphate. One c.c. of the filtered re-agent is injected hypodermically. In the case of animals, the hairy area is previously shaved. The syringe used must be perfectly dry. If the subject is alive the skin immediately around the place of injection assumes an intense blue colour, which does not change for several hours. If the subject is dead, no colour appears; or, in a few cases, a very faint localised colour may be evident. The test is applicable equally to the human subject, or to animals. It is claimed to be reliable, rapid, and simple.—G. M. Fabroni (*Achiv. farmacol.*, 1929, **46**, 177; through *Chem. Abstr.*, 1929, **23**, 3001).

Spinal (Epidural) Anæsthesia in Cattle*.

By Geoffrey B. Brook, b.sc., m.r.c.v.s.

Epidural anæsthesia in cattle was evolved by Benesch (i) in 1926, practised the same year on the continent generally and also in America. The writer has recently had an opportunity to test the Benesch method on a series of patients. Little reference to the method and its uses has appeared in British literature, so that the technique will be dealt with in some detail.

Technique.

The writer first saw the method demonstrated by Mr. Nils Lagerlöf, of the Stockholm Veterinary College, whilst visiting Sweden during the tenure of the Centenary Post-Graduate Research Fellowship of the Royal (Dick) Veterinary College, 1927-28. Briefly, the technique consists in introducing a solution of local anæsthetic into the epidural space by way of a needle passed through the first second coccygeal interarcual space (see fig. 3). The procedure will be dealt with under the following headings:

1. Regional anatomy and estimation of site.
2. Needles and syringes used.
3. Mode of injection.
4. Amount and type of anæsthetic.
5. Results of anæsthesia; with, finally, a review of eleven cases selected by the writer.

1. Regional Anatomy and Estimation of Site. At the level of the first and second coccygeal vertebræ the characteristic disposition of the spinal canal and its contents have, of course, undergone considerable modification. The bony membranous canal itself is of quite small dimensions, triangular in cross section, with base ventral, and containing 3 or more nerve trunks running to the tail (see fig. 2). These nerve trunks in the adult animal are about the size of the vagus nerve in a dog of medium-sized breed. The boundaries of the canal as it passes from the first to the second coccygeal vertebra are as follows (figs. 1 and 2):—(*a*) The floor is formed anteriorly by the posterior part of the dorsal surface of the body of the first coccygeal vertebra, half-way back by the intervertebral joint with its thick cartilages and posteriorly by the bony dorsal surface of the second vertebra. (*b*) The sides and roof are formed by the thin elastic inter-arcual ligament. This is a unique arrangement, since typically the canal is furnished with bony walls which aid in the guidance of a needle. (*c*) The floor is traversed longitudinally by a variable number (3 +) of nerve trunks referred to above.

The spinous process of the first coccygeal is directed upwards and backwards to overhang the inter-arcual space to a limited extent; the second coccygeal spine is also directed backwards, bearing the relation depicted in fig. 2.

All these facts have a bearing on the position of the needle. Firstly, in contra-distinction to the arrangement in other situations for spinal puncture, the inter-arcuate ligament (lig flava) is so extensive and loose that it gives practically no indication when the needle has perforated it. One has therefore to rely on perfect direction of the needle along the mid-plane to enter the space (B, fig. 2).

* Received on 5th December, 1929.

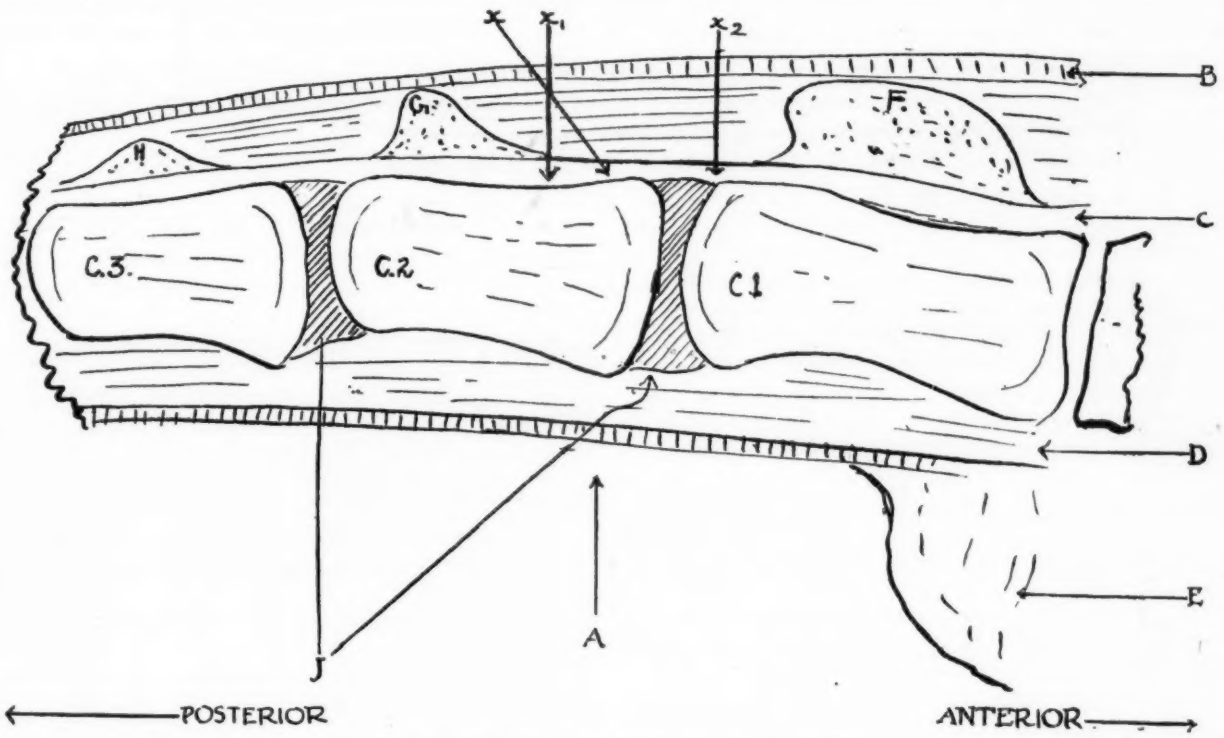

Fig. 1.—Longitudinal Section through first Three Coccygeal Vertebræ. (Drawn to Scale.)

B = Skin.
C = Spinal Canal.
D = Ventral Musculature.
E = Ischial Fat.
F = Spine of First Coccygeal Vertebra.
G = Ditto of Second Coccygeal Vertebra
H = Ditto of Third Coccygeal Vertebra.
J = Inter-vertebral Cartilages.

C_1, C_2, C_3, Bodies of first three Coccygeal Vv.

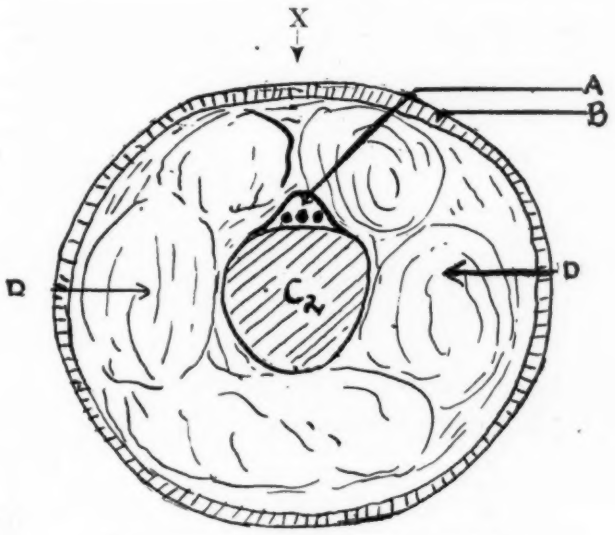

Fig. 2.—Cross Section at Level "A."

A = Epidural Space (with Nerve Roots). Height about 0.2 inches.
B = Skin.
D = Musculature.
C_2 = Body of Second Coccygeal V.
X = Line of Direction of Needle.

Note the Boundaries of the Epidural Space.

The depth to which the needle must be forced is indicated by its impinging on the bony floor of the canal (see later). So far as transverse level is concerned, the three possible lines of insertion are indicated in fig. 1 by arrows marked x, x_1 and x_2. The one selected by the writer is x, *viz.*: the needle is inserted at a point one third of the way from c_2 to c_1 and passed forward and downward at an angle of 60° to the horizontal to hit the bony floor of the second coccygeal vertebra. Both the other situations possess disadvantages. In the case of x_2 the needle may be driven downwards into and through the inter-vertebral plates of the related coccygeal joint. The writer has experienced such a mishap, and whilst it does not appear to be harmful or at the time painful, it is most misleading as to the precise depth at which to inject the solution. On the other hand, a needle inserted along the route shown by x_1 must first penetrate the resistant muscle and tissue attachment associated with the spine, c_2, and this often leads to deflection. For these reasons the route x has been selected.

The location of the site of injection in the living animal is easy. The tail is held in a horizontal position in careful alignment with the mid-dorsal line of the body (fig. 5), and in this position moved up and down in the fashion of a "pump handle." The sacro-coccygeal junction is situated at the level at which tail movement ceases; immediately behind this is a laterally-compressed bony ridge representing the summit of the first coccygeal spine, posterior to which is a definite depression, 2-4 cms. in extent, which is the space between c_1 and c_2 (fig. 1). It is through this space that the injection is made. With some practice, and especially in the lean subject, the depression in question can be defined at a glance.

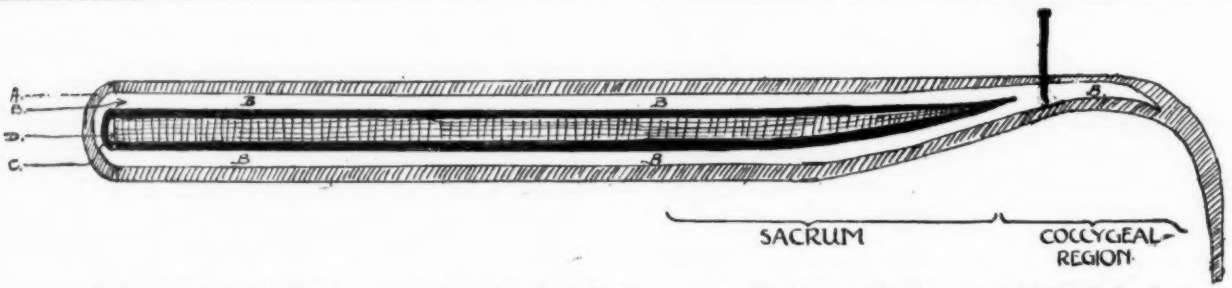

Fig. 3.—General Disposition of Spinal Canal and Contents to illustrate principle of Epidural Injections.
A = Bony Wall of Canal. C (Black) = Sub-Arachnoid Space.
B (White) = Epidural Space. Note continuity into Tail. D = Spinal Cord.
A needle is represented as entering the Coccygeal part of the Epidural Space.

Fig. 4A.—Needle drawn to scale. Total length, 10-12 cms.

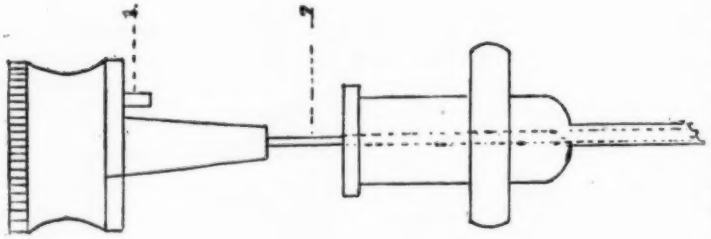

Fig. 4B.—Head of Needle enlarged to scale with stilette partially withdrawn. (1) = Stilette lock-catch; (2) = Stilette.

2. Needles. The needle used is similar to, but larger than, the one used by the writer for sacro-lumbar puncture in the dog, and has been adapted from a similar one used in human work. The needle (fig. 4) has an oblique point and is graduated in centimetres from the tip. At the six centimetre mark, a solder ring is applied, which helps to keep in view the maximum depth consonant with a successful injection. A stilette is fitted which locks itself by means of a projection received into a corresponding groove on the head of the needle (fig. 4A). The writer is aware that this needle is larger than that used by continental veterinary surgeons, who use a short needle fitted on to a syringe at the time of puncture.

The longer needle has two advantages, *viz*:—

(*a*) It can be held detached from the syringe during insertion. This enables the operator to have a finer appreciation of the layers through which the needle passes, and of the sensation of resistance offered by these.

(*b*) The line of direction of insertion can be more perfectly "sighted" and controlled.

The needles have been made for me by Arnold and Sons, London, and Messrs. Gardner and Sons, Forrest Road, Edinburgh. The syringe used is a 10 c.c. "Record." The 20 c.c. type is rather ponderous.

3. Mode of Injection. The animal is usually operated on in the standing position, though in parturition cases, etc., the injection must sometimes be done with the patient recumbent. An assistant controls the animal's head in the usual manner by grasping the nose. A second assistant holds the tail horizontal and in alignment with the sacrum. The site of operation is estimated as described above, and then clipped and/or shaved, cleansed with spirit, and finally with ether. Tincture of iodine should not be used, the iodine being highly irritant if carried in by the needle. Sterile cloths are laid around and fixed with towel clips. The needle is sterilised by boiling, and a little spirit is ejected through it, followed by a few drops of the local anæsthetic. Calcium deposits from boiling in hard water are thus swept away. The operator stands on the left of the animal near the root of the tail, with the needle in the right hand. The left hand defines the site of puncture, and the needle is then thrust through the skin (figs. 5 and 6). This procedure is not very painful. The slight mobility of the skin then permits the operator to move the needle to the precise plane along which it must be passed. The needle is then pushed steadily along the route previously described, careful "sighting" being carried out to maintain an exact mid-line position. Bone is encountered at a depth of 2-4 cms. according to the condition of the animal. The stilette is thereupon withdrawn, the syringe attached and an injection tried. If the epidural space has been entered, introduction of fluid is extremely easy and the resistance practically *nil*. With the needle in any other position expulsion of the fluid from the syringe is quite difficult. The amount of solution to be injected is discussed later.

Failure to effect a successful injection may be due to any of the following factors:—

(*a*) The needle may not be precisely in the mid-line, or the tail may be out of true alignment. These factors should be corrected if present.

(*b*) The bone impinged may be one or other of the coccygeal vertebral arches. In such cases bone is usually encountered at a depth of less than 2 cms. The obvious correction should be made.

(*c*) Other writers recommend that the needle be withdrawn slightly after impinging the bony floor, on the assumption that the tip of the needle first buries itself in the soft tissues over the bone. It has not been found necessary to practice this regularly, but in some instances it has effected a better injection. In doubtful cases this procedure should be tried. Revolving the needle slightly, say through 90°–180°, often corrects a malposition.

(*d*) In some animals it has been found impossible to perform a successful injection even after repeated attempts. This has been mentioned by other workers (7). Out of a total of 65 injections made on 42 different animals the writer has failed twice to effect anæsthesia. In one

instance the sacro-coccygeal space was successfully adopted as a new site, and in the other the lumbo-sacral space. The sacro-coccygeal space is located as described above, but the needle has to be passed to a greater depth to reach its objective, *e.g.*: 5 cms. The resistance to a normal injection is slightly greater at this site. The lumbar-sacral puncture was easily accomplished in the one instance when it was attempted. The sacral tuberosities of the ileum were located, a little anterior to their transverse level being the lumbo-sacral depression. The needle was

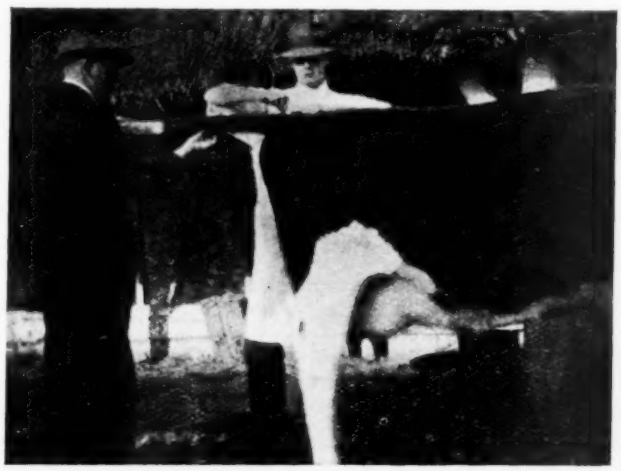

Fig. 5.—Position of Operator and Assistant during Injection. The sterile cloth has been discarded for clarity.

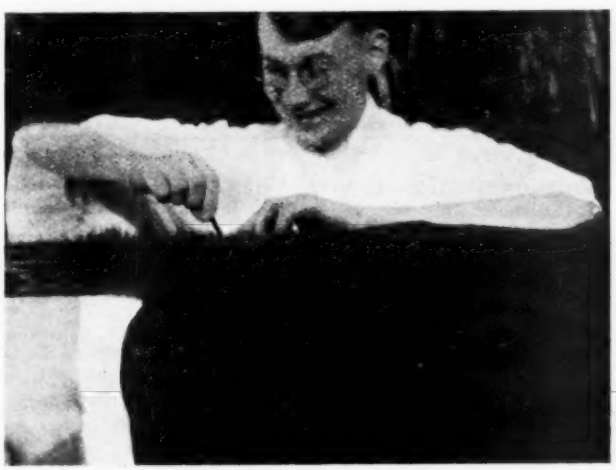

Fig. 6.—The position of the hands during Insertion of Needle. The latter has been "touched-up" on the positive to show its position more clearly.

introduced at the latter and passed ventrally for 7 cms., when the sensation of perforating a cavity was imparted to the hand. No cerebro-spinal fluid escaped, thus proving that the needle had not entered the sub-arachnoid space. Injection of the fluid was as easy as elsewhere.

4. Types of Local Anæsthetic and the Amount to be Used. Continental workers have used a preparation Tutocaine, and Richter (5) has also reported the use of Chemocain. The whole of this work has been carried out with Parcaine, a local anæsthetic prepared by Messrs. Parke Davis & Co., Ltd. It is issued in rubber-capped bottles of two-ounce capacity (*i.e.*, 56 c.cs., approx.). This solution has given uniformally good results with the exceptions noted below.

The amount of solution to be injected in a given instance is most important. In all cases where it is desirable, perhaps essential, that the animal remain in a standing position, the amount of solution injected must be such that the operation area is de-sensitized but the power of the hind limbs is not affected. Three factors appear to govern the amount employed. The first is the length of the spinal canal, the second the degree of fatness of the animal, and the third the physical state of the patient. It was necessary to establish standards of comparison. The standard of length was taken as the distance from the occiput to the sacro-lumbar junction, and cattle were divided, under this heading, into two groups:—

(1) Those with a measurement of 160 cms. and above (cows, bulls, etc.).

(2) Those with a measurement of 140 cms. or less (heifers, etc.).

With regard to fatness, the subjects have been divided into lean, medium, and fat as understood clinically. A fat cow is regarded as weighing about 13 cwts. average weight, and a fat heifer about 10½-11 cwts. L.W.

In the fat animal there is an increased amount of adipose tissue in the epidural space. This interferes with and retards the percolation of fluid along the space.

In estimating the dosage the best guide is experience. The appended table, however, gives some rough indication of the amount of "Parcaine" to use.

It is better to make a second injection, if required, than to be hampered for two hours by a too-extensive anæsthesia producing recumbency.

From the table it is apparent that the amount required to abolish sensation in the udder is certain to take away the power of the hind limbs. Hence, all udder operations must be undertaken with the animal in the prone position.

It will be seen that in the case of operations on the udder and of laparotomy, Parcaine of the standard strength has not proved satisfactory. The manufacturers are producing a solution of greater concentration for further experiment; from the remarks by Bemis (6) and Richter (5, 9) lumbo-sacral puncture will doubtless prove more satisfactory than coccygeal for such operations.

Results of Anæsthesia.

The progress of anæsthesia can best be watched in the case of a massive injection of, say, 28 c.cs. The following is a typical resumé.

Subject. Shorthorn-Friesian cross; 170 cms.; live weight approximately 11 cwt.

8.15 pm. Injection 28 ccs. Immediate flaccidity of the tail.

8.20. Udder (involved in acute mastitis), less sensitive, but still distinct reaction. Vulva and perineum slackened.

8.23 Loss tone flexor muscles of thigh. Tremors of individual groups.

8.25. Tremors of rectus mass with slight flaccidity.

8.27. Gluteal group slackening; crouching attitude adopted with typical "paddling" movements, udder sensitive.

8.30. Ditto,

Table of Amount of Anæsthetic.

Type (Animal)	Length	Condition	Operation Area	Amount	Remarks
Cow or Bull (Shorthorn type, etc.)	160 cms. upwards.	Lean	O.+U.+V.+Vu.	25 c.cs. ...	Patient not required to stand longer than 15 minutes.
		Medium	Ditto	27 c.cs. ...	
		Fat (13 cwts. L.Wt.)	Ditto	30 c.cs. ...	
Ditto...	Ditto ...	Average	Vu. only ...	8-10 c.cs. ...	Are anæsthetised in 10 minutes.
Ditto	Ditto ...	Average	Ud.	30 c.cs. ...	Results variable. Generally satisfactory in 30 minutes.
Ditto	Ditto ...	Average	Lap. forward to umbilicus.	Not determined	See discussion in Case No. 9.
*Ditto	Ditto ...	Average	Any operation as far forward as ovaries, animal standing.	17 c.cs. maximum.	
Heifer, also Small Breeds.	140 and under	Lean	O.+U.+V.+Vu.	21 c.cs. ...	As cow or bull.
		Medium	O.+U.+V.+Vu.	23 c.cs. ...	
		Fat (10½ cwts. L.Wt.)	O.+U.+V.+Vu.	25 c.cs. ...	
Ditto	Ditto ...	Average	Vu. only ...	7 c.cs. ...	Ditto.
Ditto	Ditto ...	Average	Ud.	27 c.cs. ...	Ditto.
Ditto	Ditto ...	Average	Lap., as above ...	Not determined	See discussion, Case No. 9.
*Ditto	Ditto ...	Average	Any operation as far forward as ovaries, animal standing.	15 c.cs. maximum.	

Note.—In an exhausted animal reduce all amounts by 1 c.c.
Abbreviations.—O.=Ovary. U.=Uterus. V.=Vagina. Vu.=Vulva. Ud.=Udder. Lap.=Laparotomy.
No figures are available for operations on the penis, etc., of the male.

8.32. Marked inco-ordination hind limbs.

8.34. Subject lay down without violent struggling and assumed easy posture of limbs.

8.36. N.F. teat excised. No reaction.

If smaller amounts of anæsthetic are used, the progression of anæsthesia is modified as follows:—

1. There is no immediate flaccidity of the tail. This may not be obvious for 5-10 minutes. Only in large injection is the condition of the tail an immediate criterion of successful anæsthesia.
2. Abolition of sensation in the vagina is delayed.
3. Inco-ordination to the extent of slight swaying may be seen 40 minutes after the injection.

Physiology of "Straining."

In a number of cases it has been noticed that, as soon as the vulva is anæsthetised, "straining" on the part of the patient is abolished and a vagina may be palpated without reaction. This confirms the well-known fact that the afferent nerves concerned in the "straining" reflex terminate in the posterior part of the vagina and around the vulva. If at such a stage in the anæsthetization the hand be passed into the uterus, a slight re-action is still evinced. This seems to indicate the presence of a "uterine reflex" as a separate entity.

As the rectum is paralysed no fæces are passed. This is a great aid to the practice of surgical cleanliness in parturition and other cases.

"Ballooning" of the Vagina.

During the ovariotomy referred in the case list (No. 6) an observation was made which pointed to the mechanism of vaginal "ballooning."

At a certain time after the injection the vulva and vagina were relaxed and completely insensitive to manipulation. A cold solution of sodii bicarb (½ per cent.) was introduced into the vagina, which immediately became dilated. The cavity was then irrigated with 1-8,000 hydrarg. perchlor solution, and, the vagina being tensely ballooned, an incision was made immediately, with no reaction. From these facts it is safe to conclude that at the time of lavage and incision the vulva and vagina were completely anæsthetised and the musculature relaxed; that is, all nerve messages, sensory or motor, were blocked. Under these conditions cold solu-

tions of either sodii, bic., or hydrarg. perchlor. induced marked ballooning. Ballooning, therefore, does not depend wholly, if at all, on a spinal reflex.

The Control of the Cervix Uteri.

Epidural anæsthesia appears to have little effect on the degree of relaxation of the cervix. In certain parturition cases the cervix was unusually constricted and formed a tense circular band between vagina and uterus proper. Complete anæsthesia produced no further relaxation.

Case No. 7 (*vide infra.*) illustrated this well. The cow had fallen in the byre 6 weeks before parturition was due. She was unable to rise and remained recumbent in a loose box for three weeks. Labour pains then commenced. The cervix was found only slightly relaxed. The calf, obviously dead, was becoming œdematous through decomposition. Profound anæsthesia (spinal) had no effect on the cervix and so did not solve a difficult problem.

Generalised Tremors.

In one instance a small injection (18 c.cs.) was followed by marked tremors of the shoulder and neck muscles. The shivering ceased in 15 minutes and the animal was normal after the usual period.

Recovery.

An animal recovers from the effects of the injection in from one to four hours. A 28 c.c injection will usually maintain decubitus for from two to four hours. A 20 c.c. injection may have passed off in 60 minutes. Until complete co-ordination is established an attendant must remain with the animal to keep the hind limbs in a normal position. Since the patient has little control over these extremities, they may work into dangerous postures leading to injury. The writer has not seen such a mishap. Control of the patient is especially important where the anæsthesia is sufficient to produce inco-ordination without recumbency. In such a case the animal, if free, may stagger several steps, and slip down heavily and so injure itself.

Expulsion of the fœtal membranes does not seem to be interfered with, and occurs usually before the animal rises. In fifteen parturition cases one retention has occurred. No *post-partum* hæmorrhage has occurred.

The Effect of Serial Injections.

In certain cases (prolonged embryotomy, *post-partum* straining) several successive injections have been made. In one case (No. 12) of embryotomy, followed by uterine prolapse, three injections of 20 c.c.'s were made at intervals of two hours. No ill effects were observed.

A heifer showing persistent straining after calving received four injections, one on each of four successive days. The case ended fatally, but the animal recovered full power of the limbs after each injection, and the writer was satisfied that the anæsthesia was not related to the death of the animal. A *post-mortem* was made in this case.

Contra-indication to injection.

Certain types of injuries, *e.g.*, fractures or dislocations in the pelvic region, constitute a contra-indication to anæsthesia.

The resultant abolition of local muscle support may lead to dangerous displacement in case of a pelvic fracture. In the case of hip dislocation the method might be employed to attempt reduction.

Clinical Cases.

It is now proposed to review some clinical cases.

Sixty-five injections have been made on 42 different animals. The conditions in connection with which anæsthesia was performed included :—

(*a*) Parturition with dystokia.
(*b*) Eversion of the uterus.
(*c*) Removal of retained placentæ.
(*d*) Ovariotomy.
(*e*) Prolapsed rectum.
(*f*) Inspection of genital organs in sterility.
(*g*) Cæsarean section (with torsion of uterus).
(*h*) Post-partum straining.

Case 1. Subject, shorthorn cow, 168 cms., parturition, posterior presentation. Twin calves.

Injection, 26 c.c. Delivery, 10 minutes. Recumbent in 20 minutes. Fœtal membranes passed 2 hours. Recovery, 3 hours.

Case 2. Subject, Jersey cow, 165, parturition anterior presentation, head bent back, large cross-bred calf.

Injection, 26 c.cs. (excessive). Delivery, 10 minutes. Recumbent in 15 minutes. Fœtal membranes passed 4 hours. Rose in 5 hours.

Case 3. Subject, lean heifer, 160, *post-partum* incontinence of urine for six weeks. Great vaginal tenderness.

Injection 18 c.cs. Tail flaccid in 5 minutes, vagina in 7. Speculum and illuminant gave very precise view of vagina, cervix and urethral opening, etc., to diagnose healing vaginal tear, cervical discharge, cystitis, etc. In 15 minutes heifer showed inco-ordination but never collapsed. (Note amount injected.)

Case 4. Shorthorn, large type, fat. Parturition, head deflected, cervix constricted to form obstructing band.

Injection 18 c.cs. No flaccidity of tail for 5 minutes and other effects correspondingly delayed. Cervix unaffected. Illustrates remarks on effect of fat condition and on the cervix.

Case 5. The case reviewed on page 33.

Case 6. Subject, adult Shorthorn, half fat (L.Wt. 12 cwts.), ovariotomy to abolish frequent œstrum.

Injection, 18 c.cs. after several ineffective attempts; the animal showed no pain throughout and inco-ordination did not appear for 30 minutes. Never recumbent. Vaginal relaxation such that incision was sutured in two places with silk. This case illustrates the action of maximum "standing" dose with complete anæsthesia of the genital tract for this type of animal.

Case 7. Cow, Jersey, 130 cms.

Injection, 20 c.cs., 6 p.m.; 20 c.cs., 9 p.m.

Subject referred to previously as having slipped and then unable to rise (V.S. preceding column). Died from general poisoning (metritis, etc.).

Case 8. Cow, Shorthorn, 180 cms., fat, eversion uterus.

Injection, 28 c.cs. Uterus replaced, vulva sutured, uneventful recovery.

Case 9. Heifer, 135 cms., lean, torsion uterus irreducible; cæsarean section.

Injection, 35 c.cs. Heifer laid down in 10 minutes. Abdominal incision, commenced 30 minutes after injection; extended from udder behind to the level of the umbilicus, three inches to the left of the mid line. Anæsthesia imperfect and supplemented by chloroform. (See note on this, V.S.).

Case 10. Shorthorn, 175 cms.; medium condition. Acute infective mastitis with high teat obstruction in near fore quarter.

Injection 35 c.cs. Recumbent in 15 minutes. Anæsthesia of udder imperfect, but about 35 minutes after injection seemed more satisfactory, when teat was amputated.

Case 11. Jersey, 143 cms. Irrigation uterus according to Albrechtson's method.

Injection, 14 c.cs. Usual sequence. Small vagina rendered much more capacious; dangerous straining abolished.

Case 12. Shorthorn cow, 170 cms., parturition; total deflection of head and neck.

5.30 a.m. 19 c.cs., Parcaine; unsuccessful attempts to reduce dystokia. Decided remove right fore limb.

6.45 a.m. 15 c.cs.; right fore limb removed with Benesch embryotome. Remainder of calf delivered after 10 minutes.

9 a.m. Uterus observed on the point of eversion. 28 c.cs. injected into uterus; replaced vulva, sutured, etc. The cow made an uneventful recovery. Total amount injected, 62 c.cs.

Acknowledgements.

The writer is indebted to Messrs. Parke, Davis, & Co., Beak Street, Regent Street, London, for kindly supplying the " Parcaine " solution used in the trials free of charge. The writer also desires to state that all the cases referred to occurred in the practice of Major Catmur, Abingdon, Berks.

Note.—Both Messrs. Gardner and Sons and Messrs. Arnold and Sons have agreed to make spirit-proof cases to contain four needles. The use of such will obviate the necessity of first boiling the needles.

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Hannah Dairy Research Institute.

The following is a statement forwarded to us from the above Institute for publication:—

During the past year there has been considerable discussion in the public press and elsewhere with regard to the eradication of tuberculosis from the dairy herds of the country. While concrete schemes have been put forward by various individuals and public bodies, no practical work towards eradication has yet been carried out in any considerable area in Great Britain.

In an effort to obtain definite information on the possibility of devising a scheme of eradication suitable to local conditions, and on the probable expenditure which such a scheme would entail, the Hannah Institute has initiated a small experimental scheme in a local area in the south-west of Scotland. This has been made possible by the provision of funds which the Institute has obtained from private sources.

An area of approximately nine square miles, embracing some thirty dairy farms, has been selected for the experiment. Eradication will be based on isolation methods, but the scheme will be as elastic as possible in order to meet the conditions existing on each individual farm. The work undertaken by the Institute will consist essentially of (1) free tuberculin-testing of all animals in the area by the double intradermal method, and (2) the supervision of the isolation of reactors and of the rearing of young stock. The work will also include the testing of the milk supply of the area for the presence of tubercle bacilli, both before and after eradication. The investigation should, therefore, provide data not only on the possibility of eradication itself, but also on the effect of eradication on the purity of the milk supply.

In order to enable this work to be carried out efficiently, the Joint Committee of Management of the Institute has appointed Mr. L. Jordan, M.R.C.V.S., as Veterinary Pathologist to the Institute, and he will be in personal charge of the scheme. It might be of interest to mention that Mr. Jordan was, until recently, a member of the staff of the Institute of Animal Pathology at Cambridge.

In planning the general outline of the scheme, the Institute has had the assistance of an influential Committee of the Medical Research Council, a fact which has insured that the methods adopted are in conformity with the most modern scientific knowledge of the subject. Further, the value of co-operation with the local veterinary practitioner has been recognised, and the Institute has been fortunate in obtaining the collaboration of Mr. R. Smith, M.R.C.V.S., who is undertaking the testing in conjunction with Mr. Jordan.

The results of the investigation will be awaited with considerable interest, especially in view of the somewhat similar scheme of eradication which has been put forward by the West of Scotland Division of the National Veterinary Medical Association and which is at present the subject of considerable discussion in agricultural and veterinary circles.

At a meeting of the Central Executive Committee of the National Farmers' Union of Scotland in Glasgow, it was decided to convey to the Ministry of Agriculture their views that compulsory measures are necessary for eradicating the warble fly.

Winter Census of Live Stock.

The Ministry of Agriculture has decided to make a census of live stock on January 11. In the past a June census has sufficed, and it is difficult to see what benefit can result from duplicating the work and the cost. It is true that a summer census may not represent fairly the arable counties, where the fattening of cattle and sheep is more a winter than a summer occupation, but any information that can accrue from this additional record of livestock distribution, while it may be of statistical interest, can be of little practical importance.—*The Times.*

The Veterinary Record.
11th January, 1930.

Artificial Insemination.

In this week's issue we publish an authorised translation of a masterly paper on the artificial insemination of mammals, by Professor Iwanow, the Director of the Department of Biological Reproductive Research of the State Institute of Veterinary Experimental Medicine, Moscow. In this paper we are given an insight into the splendid manner in which Russian veterinarians are tackling a problem of great economic importance to their country. It would appear that there is a considerable shortage of the best stock in the country, and great practical use is being made of artificial insemination as a means of improving livestock of all kinds. An examination of the numbers quoted reveals that the practice is by no means in the experimental stage, but that annually enormous numbers of young of all types are born as the result of this artificial method of impregnating their female parent.

The practice is not limited to equines, but is also practised in cattle, sheep, fur-producing foxes, and the best burden-carrying hybrids.

An interesting sidelight is the knowledge regarding the functions of the accessory genital glands derived from their researches.

In this country artificial insemination has not been carried out to any great extent, and probably never with a view to improving livestock. It is generally resorted to when pregnancy, as the result of natural coitus, fails, and the results attending its use have been disappointing, usually due to the fact that sterility is attributable to some disease of the female genitalia.

As a means of controlling the incidence of dourine, the practice of artificial insemination is, fortunately, only of academic interest to us. Regarding bovine contagious abortion, experts are at variance as to the importance of the part played by the bull in the transmission of this disease.

There are still parts of the world in which the domestic animal is the most important factor in transport, and we congratulate Professor Iwanow and his colleagues upon the success which has attended their efforts to improve the livestock of their country.

Clinical and Case Reports.

Malignant Growths in a Sheep in Uganda.

Note by Major A. N. Foster, o.b.e., f.r.c.v.s., Senior Veterinary Officer, Uganda.

In March, 1927, whilst doing duty in Teso District of the Eastern Province, Uganda Protectorate, my attention was drawn to a full-grown ram which was suffering from two tumours, one situated in the region of the left elbow, the other situated on the abdominal wall.

The subject was a native-bred animal—of the fat tailed variety with a hairy coat. It was black in colour. The larger tumour was about the size of an ordinary hen's egg and was situated immediately behind the left elbow. The smaller tumour was about the size of a walnut, and was situated on the abdomen immediately in front, and a little to one side, of the opening of the sheath. Both tumours had an ulcerated surface, and were actually in the skin—not subcutaneous

I removed both tumours by operation on March 31st, 1927, and considering them to be malignant and probably metastatic, forwarded them to the Veterinary Pathologist —Entebbe, Uganda—who informed me that, on histological examination, the tumours proved to be small-round-celled sarcomata. The operation wounds healed completely, though in the case of the wound in the left elbow region the process of healing was very considerably retarded by movement of the part. The ram was and remains in fair condition; his general well-being does not seem to have been interfered with.

There is at date no sign of recurrence of the growths, or of other growths appearing elsewhere in the animal. The case appears to be worth recording, as cancerous growths are not exactly of common occurrence in the domesticated animals—and it is the first instance of that condition with which I have met in any animal in Uganda.

Since recording the above the following note on the same case has been recorded and forwarded to me by Captain Aitken.

Note by Captain W. S. Aitken, Veterinary Officer, Uganda.

On May 12th, 1928, my attention was drawn to a ram at the Soroti Stock Farm. This animal was a native-bred one, black in colour, with a hairy coat and was of the fat-tailed variety.

There were eight tumours, three around the lips about the size of a broad bean, two on the left arm about the size of a hen's egg, and three on the right arm about the size of a hen's egg. All these tumours had ulcerated surfaces.

I was informed that you had removed similar tumours from this animal.

I removed all these growths on May 14th, dressing the wound with a 1·50 solution of silver nitrate. The wounds on the arms healed but those around the lips were most difficult to heal.

The animal at first picked up condition, but afterwards began to fall off in condition. On June 19th I found numerous small tumours about the size of a pea around the lips and two on the tongue. I removed the small ones around the lips, but could not get at the two on the tongue.

The animal gradually lost condition and died on June 28th.

The *post-mortem* examination revealed nothing abnormal.

Paraffin Poisoning in a Terrier.

By F. C. Heathcote, M.R.C.V.S., Cheshunt.

Perhaps a toxicologist will oblige by telling me what is the antidote for paraffin poisoning. I had a true case of this in a terrier dog, 15 months old, to which his owner had administered a tablespoonful of ordinary commercial paraffin, in the belief that it would expel worms. The terrier was seen by me about a quarter of an hour after swallowing the paraffin. The symptoms were dyspnœa, extremely pallid mucous membranes, coldness of the body and extremities, trisiness, accelerated pulse, and clonic spasms. I immediately injected one-fifth gr. apomorphine hydrochor., with no result. I then gave a hot enema, also without a result. The dog was now rapidly losing consciousness and artificial respiration was begun. It was suitably covered in a warm wrap. After a quarter of an hour, the dog vomited mucous and had a slight motion from the bowel, the breathing improved and consciousness returned, but death occurred some three hours afterwards*. It will be interesting to know whether such a case has been treated successfully and what is the appropriate treatment.

Distemper in Dogs.

SUCCESS OF VACCINE TREATMENT.

Committee's Report.

(Reprinted from "The Times.")

The Duke of Portland, president of the *Field* Distemper Council, has signed and approved the publication of the report of the Scientific Committee, which is presented by Sir Charles Martin, F.R.S., its chairman.

In their last progress report, in November, 1928, the committee stated that the researches carried out by Dr. Laidlaw and Mr. Dunkin had demonstrated beyond peradventure that the method of preventive inoculation devised by them was capable of making dogs resistant to infection by distemper, and that the time had arrived to arrange for the production of the prophylactic and its distribution on a commercial scale.

Although the whole processes of manufacture of the vaccine had been made public through scientific journals and there was nothing to prevent any firm attempting to make it, the committee recommended that the *Field* Distemper Council should invite a well-equipped commercial laboratory to undertake the manufacture and distribution, with the assurance that the committee's investigators would, at the outset, give every assistance in technical questions of the preparation and standardization of the product.

* Unfortunately, I was not given the opportunity of making a *post-mortem* examination, as the owner did not wish it.

Large Scale Production.

This recommendation was approved, and Messrs. Burroughes Wellcome and Co. were invited to undertake the manufacture and distribution of the prophylactic on a commercial scale. The firm agreed to do this and at once began to make the costly installation necessary for production on a large scale at the Wellcome Physiological Research Laboratories.

Meantime the American Distemper Committee had entrusted the manufacture of distemper prophylactic in the United States to the Lederle Laboratories, Pearl River, New York State, and to the Mulford Laboratories, Philadelphia.

The more extended experience which the committee's investigators have now had of the use of the method in the field has but strengthened the conclusions:—(1) That it is possible to induce a resistant state in a susceptible dog by means of a suitable dose of vaccine; (2) that this resistant state may be converted into immunity by means of a small dose of living virus; and (3) that dogs which have received both inoculations are solidly immune against the natural disease. It further seems clear that the whole process, including the administraton of living virus, is reasonably safe, provided that due precautions are taken.

The most important precautions are, that only *healthy* dogs should be treated and that the dogs should be isolated throughout the immunization process. Upwards of 2,000 doses of prophylactic have been issued and the total mortality has been less than 1 per cent. This figure has been arrived at by placing all doubtful cases against the method. Over and above this small percentage of fatalities there has been a further small proportion of animals which have shown an unusually severe reaction to the living virus, and have caused the veterinary surgeon in charge and the owner anxiety for a time. In many instances the immunized animals have been in contact with severe cases of natural distemper and have remained unaffected and, so far as the committee are aware, there are extremely few cases in which a dog that had received the treatment subsequently succumbed to distemper, *i.e.*, in which immunization failed.

Although each batch of vaccine and virus issued by the Wellcome Laboratories is tested upon a number of *healthy* dogs before it is passed for issue, it is hardly to be expected that each and every dog subsequently treated will give a perfect response to the vaccine and become so far resistant that *no* disturbance follows the injection of the living virus. The reaction to the second (virus) injection is likely to be severe unless the animal is in good health. As emphasized in the directions issued with each dose of the prophylactic, it is important to ensure that dogs are not suffering from, or exposed to, infections at the time they are undergoing prophylactic treatment. The committe can only suppose that this warning as to submitting none but healthy dogs to the treatment has not always been regarded. When severe reactions or fatalities occurred in one kennel, the results in other kennels in which the hounds were inoculated with the same batch of vaccine and virus were reported to be completely satisfactory, suggesting that some condition of the animals and not the materials injected was responsible for the untoward result.

H.M. Stationery Office Publications.

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses:—London: Adastral House, Kingsway, W.C.2, and 28 Abingdon Street, S.W.1; Cardiff: 1 St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120 George Street.

Statutory Rules and Orders:—	*Price*	*Net.*	*Post Free.*
890. Animal. Diseases of Animals. Order of the Minister of Agriculture and Fisheries, dated October 14th, 1929, as to the conveyance of animals on the weather deck of certain vessels between November 1st and March 31st	s. d. 0 1	s. d. 0 1½	
House of Commons Reports and Papers:—			
105. Importation of Plumage (Prohibition) Act (1921) Amendment ...	0 1	0 1	

From The Veterinarian,

November, 1829.

Soundness in Horses.

By Mr. W. Percivall.

(Read at the Veterinary Medical Society, October 21st, 1829.)

(*Continued from page* 10.)

I shall now pass on to

Soundness in Action.

By which I mean, the ability to move the limbs with that ease, power, and effect, which is natural to them.

The principles I have been endeavouring to establish to guide us in questions of soundness in constitution, are the same that strike me as the most natural for us to follow in regard to action. In the first place, I should say—

That actual or recognised disease of limb (whether lameness were present or not) constituted unsoundness. And, secondly, that any condition of their parts, impairing natural action or capacity, also constituted unsoundness.

On which principles, not only are all lamenesses cases of unsoundness, but also every such altered condition of parts as can be shown, either from their very nature or by the aid of experience, to impair present action or diminish its natural powers, either of extent or durability.

A horse may have a sand-crack and not go lame from it; nevertheless, that horse is, in my opinion, unsound, because his cracked hoof no one could reasonably argue was adequate to the same performances of exertion as a sound one.

A splint, unless lameness, or altered action, or cutting accrued from it (which we know to be not often the case), is not in itself an unsoundness; but a spavin I look upon always to be so, because, although lameness may not be present, experience has taught us that the limb is not equal to the same feats of strength and exertion as a sound one. By parity of reasoning, I take a curb to be an unsoundness.

This deduction is founded upon the logical maxim,

"*Ab actu ad posse valet consecutio*;"

and, although I am aware that cases may be adduced presenting very dubious complexions, still, I cannot refrain from thinking that, as a general rule, applied with professional judgment, it may be made a very serviceable one.

Stringhalt renders a horse unsound, in consequence of its rendering the action of the limb less effective.

But windgalls, unless they be in a state of actual disease, or from their magnitude or dropsical connection with some joint, can be shown to interfere with action, do not render a horse unsound; this includes thoroughpins and bog spavins.

A vast deal of disputation and wrangling has been lavished on the subject of frush; some stoutly contending that it did constitute unsoundness; others, as obstinately, that it did not; while a third set of these jurisconsults connected it with soundness or unsoundness, dependent upon its being attended or not with lameness; so that one hour the horse might receive a certificate of soundness, while on the next (having perhaps been ridden, or had his frog dressed, in the interval) he would obtain one of unsoundness. That I may not needlessly take up time on a point of such insignificance, should I be asked to resolve it, I shall want to know of my querist, whether he considers a frush to be a disease; if he does, the question is answered; if he does not, I see no other way of resolving it than that of submitting it to the test of impairment of function or capacity. However, after all, it is an affair which one would think naught but fraud could ever raise into importance.

(*To be continued.*)

The National Veterinary Benevolent and Mutual Defence Society.

Annual Meeting at Manchester.

The Annual General Meeting of the above Society was held at the Grand Hotel, Aytoun Street, Manchester, on Wednesday, November 20th, 1929, at 2.15 p.m.

The Chair was occupied by the President (W. Woods, Esq., F.R.C.V.S.), and other members present were Messrs. J. Spruell, A. W. Noel Pillers, J. Holroyd, E. H. Curbishley, W. G. Burndred, F. Hopkin (Hon. Treasurer), Col. Brittlebank (Hon. Secretary), and R. C. Locke (Assistant Hon. Secretary).

Apologies for unavoidable absence were received from Messrs. J. Lindsay (Vice-President), S. H. Slocock, G. P. Male, J. H. Wright, J. McKinna, G. H. Locke, and Major Hobday.

The minutes of the last Annual Meeting were taken as read.

Election of Officers.

President.—It was proposed by Col. Brittlebank, seconded by Mr. Curbishley and unanimously resolved, that Mr. W. Woods, F.R.C.V.S., be re-elected President for the ensuing year.

Mr. Woods, before accepting office, wished it to be definitely understood that it was on condition that it be recognised by all concerned that the individuality of the Society was not to be interfered with in any way.

The Society had been in existence for a great many years and to a great extent the lines laid down for the administration of the Society by those who had been responsible for its foundation and its development during its earlier years, had been faithfully followed. Very few people knew how hard and devotedly those pioneers of the Society, the only one of its kind in existence, had worked on its behalf and he could not contemplate with equanimity anything which would be done to undermine the great work which they had achieved. The Officers of the Society had carefully built up an organisation which was capable of doing a great service to the profession.

Many members had had experience of the extremely valuable services that the Society could render, when they had found themselves involved in litigation which grew more and more expensive every day and became an intolerable burden on individuals who had slender resources with but little knowledge of the law.

He need scarcely add that economy in management and administration had been their watchword, and the funds now accumulated to the credit of the Benevolent Fund were the testimony of their devoted services. Unfortunately, however, the yield from this fund was still far from adequate for the calls made upon it from time to time, but he could unhesitatingly say that no deserving case had ever been brought to their attention which had not been relieved as far as lay within their power.

He could not understand why any members of the profession, particularly those engaged in general practice, remained outside the Society. It was undoubtedly the cheapest form of insurance that they could undertake, with the added gratification of the knowledge that in addition to insuring themselves they were also lending

a hand to the sacred task of helping those who could not help themselves.

Finally, he need scarcely add the particular gratification he felt at the closest co-operation of benevolence that existed between the Society and the Victoria Veterinary Benevolent Fund. This close co-operation was, to a great extent, due to the fact that the Secretary of their Society, Col. Brittlebank, was also the President of the Victoria Veterinary Benevolent Fund.

In conclusion, he wished firstly to thank all the members present for re-electing him and secondly, all the Officers of the Society for their work during the past year, and he would ask all those present to do all they could to persuade members of the profession who had not already joined the Society, to become members without delay.

Vice-President.—Mr. Curbishley proposed, Mr. Noel Pillers seconded, and it was unanimously resolved that Mr. J. Lindsay, M.R.C.V.S., Dumfries, be re-elected Vice-President for the ensuing year.

Council.—The following were elected as the Council of the Society for the ensuing year:—

Mr. A. W. Noel Pillers, Liverpool; Professor F. T. G. Hobday, London; Mr. J. Holroyd, Blackburn; Mr. E. H. Curbishley, Alderley Edge; Major J. H. Wright, Manchester; Messrs. J. Spruell, Manchester; D. Imrie, Glasgow; J. Clarkson, Garforth, Leeds; C. Hartley, Lincoln; W. D. Rees, Penygraig, Glamorgan; W. Shipley, Great Yarmouth; W. K. Townson, Peterborough; L. W. Wynn Lloyd, Carnarvon; Major W. G. Burndred, Hanley; Messrs. G. H. Locke, Manchester; J. McKinna, Huddersfield; H. Sumner, Senr., Liverpool, and W. Packman, Bury.

Hon. Treasurer.—In proposing the re-election of Major Hopkin as Hon. Treasurer, Mr. Woods said that since he had been President of the Society he had been intimately concerned with the work of the Hon. Treasurer, and he could not but express admiration for the way it had been carried out. Mr. J. Holroyd seconded, and the proposition was carried unanimously.

Hon. Secretary.—Mr. Woods, in proposing that Col. Brittlebank be re-elected Hon. Secretary, said that the Society could not find a better man anywhere for the office. Col. Brittlebank gave a tremendous amount of time in the interests of the Society, and the large increase in the membership was to a great extent due to his efforts. Mr. J. Holroyd seconded and the proposition was carried unanimously.

Col. Brittlebank, in reply, expressed his pleasure at the continued confidence shown by the members and agreed to serve for one further period only, as he desired to be released from the office, more particularly in the view of the fact that he had an exceedingly efficient Assistant Hon. Secretary in whose hands they could safely leave the conduct of the business. He hoped that his wishes in this direction would not be opposed at the next Annual Meeting.

Assistant Hon. Secretary.—It was proposed by Col. Brittlebank, seconded by Mr. Woods, and unanimously resolved, that Mr. R. C. Locke be re-elected Assistant Hon. Secretary for the ensuing year.

Auditors.—Major J. Adamson and Messrs. Litton, Pownall, Blakey, and Higson were appointed Auditors for the ensuing year.

Hon. Treasurer's Report.

The Hon. Treasurer (Major Hopkin), in presenting the Financial Statement for 1928, pointed out that the Society was in a satisfactory financial position. This, to some extent, was due to there being no expenses accruing from the Defence Fund, and to the list of members in arrears with subscriptions being a much lighter one than in previous years. There had been an increase in the number of members by 62 during the year, and he thought it would be agreed that this was very satisfactory.

Seven members had died, one had resigned, and three had been struck off the list of members. The total membership at the end of the Financial Year was 273.

It was proposed by Mr. J. Spruell, seconded by Mr. J. Holroyd, and unanimously resolved that the Financial Statement for 1928 be received and adopted.

Correspondence.—Letters were read from Messrs. J. W. Pollock (Helmsley) and S. Wharam (Leeds), and the Secretary's replies thereto were approved.

The meeting concluded with a vote of thanks to the President for his conduct in the Chair.

Parrots as Disease Carriers.

Under the above heading *The Times*, of December 27th, printed the following message from its Berlin Correspondent:—"About 20 people, three of whom have died, have been admitted to hospitals in the west of Berlin recently suffering from an illness which, it is believed, they had caught from parrots.

"The S.S. 'Arkona' brought a large consignment of the birds (apparently from South America) to Germany on November 14th. Some of them were detained in Hamburg and the others were bought by a Berlin dealer, who sold a number to residents in his neighbourhood. Several of the purchasers became seriously ill, the symptoms in all cases being similar, and in three cases death followed.

"The doctors have apparently been unable to identify the disease, but believe the parrots to have been the medium of infection. The police have instructed the head of the Municipal Health Authority in Charlottenburg to make a bacteriological investigation and have issued a warning against the fondling of these or other pets."

It was recently reported in the *Daily Express* that a London doctor died from psittacosis, an infectious disease contracted from a parrot, and Dr. Newsholme, the Birmingham Medical Officer of Health, stated that within the past two years several cases of this disease had occurred in Birmingham, infection being due to parrots and other birds. Dr. Newsholme added:—

"Any young bird that shows a catarrhal condition should be quarantined or destroyed. Love birds are a source of infection. Out of eleven patients treated for psittacosis contracted from birds in Birmingham and district during the past two years, four of the cases have proved fatal."

The text of the Slaughter of Animals Bill was issued recently. It applies to all animals, but Jews and Moslems are permitted to slaughter animals in accordance with their religion.

In no case, the Minister of Agriculture states, have animals been slaughtered during the past five years which have not been exposed to any risk of infection with foot-and-mouth disease.

Notes and News.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

Jan. 13th—Meeting of the Editorial Committee, N.V.M.A., at 10 Gray's Inn Square, London, W.C.1, at 4-30 p.m.

Jan. 14th—Meeting of the Derbyshire Division, N.V.M.A., at Derby.

Jan. 16th—Meeting of the Lancashire Division, N.V.M.A., at Manchester.

Jan. 17th—Annual meeting of the Mid-West and South Wales Division, N.V.M.A., at Bristol.

Jan. 31st—Issue of overseas Voting Papers, R.C.V.S. Council Elections.

For the Annual Meeting of the Mid-West and South Wales Division, N.V.M.A., the President of the Association (Mr. G. P. Male), Dr. Savage (M.O.H. for Somerset), and Mr. H. W. Steele-Bodger, of Tamworth, have promised to make the journey to Bristol on the 17th inst. to take part in the discussion on the West of Scotland scheme for the eradication of bovine tuberculosis.

Reference to this enterprising Division reminds us that Mr. Charles Perry, the popular Hon. Secretary, has a brilliant son whose accomplishments and activities have occupied considerable space in recent issues of the *Bristol Times and Mirror*. We learn with interest that Dr. Bruce Perry holds the following appointments:—Hon. Physician to the Bristol Royal Hospital for Women and Children; Registrar to the Bristol General Hospital; member of the staff of Bristol Dispensary, and, as a recent appointment, Demonstrator in Anatomy, Bristol University. Dr. Perry is also the holder of a Colston Scholarship for Cardiac Research at the Bristol General Hospital; moreover, at the last meeting of the Senate the Dean of the Faculty of Medicine announced that the President and Council of the Harveian Society had awarded him the biennial Buckston Browne Prize of £100 and medal for an essay on "Chronic Streptococcal Illnesses."

Finally, we reproduce the following notice of marriage:—

Perry—Harvey.—December 17th, at Midsomer Norton, Charles Bruce Perry, M.D., M.R.C.P., eldest son of Mr. and Mrs. C. E. Perry, F.R.C.V.S., Woodlands, Staple Hill, Bristol, to Mildred Bernice Harvey, M.B., Ch.B., daughter of Mr. and Mrs. W. Harvey, Three Tunny's, Paulton.

Army Veterinary Service.

London Gazette—War Office—Territorial Army.

December 31st, 1929:—Major J. S. Bowden, O.B.E., T.D., to be Bt. Lt.-Col. (January 1st).

Movements of Officers.

Major J. J. M. Soutar, O.B.E., reverted to the British establishment from the Iraq Army on December 16th, 1929, and is now doing duty in the London District.

Major G. E. Oxspring proceeded to Egypt, on duty on a horse ship conveying horses to that country, on December 16th, 1929; he will later embark for India, for a full tour of duty abroad.

Major E. G. Turner, D.S.O., has been seconded for duty with the Iraq Army, and sailed on December 20th, 1929.

Major J. R. Steevenson, D.S.O., arrived home from Malta on December 18th, 1929, and is at present on leave.

Major C. J. R. Lawrence, O.B.E., arrived home from Egypt on December 18th, 1929, and is now doing duty at Brighton.

Lieut.-Colonel G. P. Knott, O.B.E., arrived home from India on December 31st, 1929, and has been posted to York, for the purpose of assuming duty as Assistant Director of Veterinary Services of the Northern Command.

Majors G. F. Steevenson and D'A. S. Beck, arrived home from India on December 31st, 1929, and are doing duty at Shorncliffe and Aldershot respectively.

Major J. O. Andrews, D.S.O., sailed for India on December 31st, 1929, for a full tour of duty abroad.

R.C.V.S. Obituary.

Howatt, John, 34 Great James Street, Londonderry. Graduated Glasgow, April 16th, 1872. Died, December 30th, 1929. Age, 77 years.

"Mr. Howatt was one of the oldest veterinary surgeons in Ireland," says the *Irish Times*. He was a native of Glasgow, in the University of which he qualified in 1872. Mr. Howatt came to Derry half a century ago. He was inspector under the Contagious Diseases (Animals) Act, and he was the Corporation's Inspector of Dairies. He is survived by his second wife, who is a daughter of Provost Macintyre, of Pollokshaw, Glasgow, and a Justice of the Peace for Renfrewshire.

Armstrong, Carter, Whiteladies House, Alma Road Avenue, Clifton, Bristol. Graduated Dublin, 15th December, 1909. Died 1st January, 1930, age 43 years.

The *Bristol Evening World* records the death of Mr. Carter Armstrong, M.R.C.V.S., of Clifton, Bristol, who was found dead in his surgery on New Year's Day.

Mr. Armstrong had been in practice in Clifton for a number of years, and after the Great War, was in partnership with Mr. Bishop and practised at the junction of White Ladies Road and St. Paul's Road.

This partnership, it is understood, was terminated some time ago, and Mr. Armstrong has since carried on his profession in Alma Road Avenue.

Immunity of Animals and Plants.

In the course of a lecture given to the members of the Natural History Section of the Greenock Philosophical Society on "Some of the Causes of Immunity in Animals and Plants," Mr. J. Donaldson Pottie, M.R.C.V.S., said he considered that every encouragement should be given to research workers to discover strains of both animals and plants which were known to be immune from certain diseases, and thus breed healthy stock of animals and plants for the use of man in trade and commerce. The future of all animal medicine was to be looked for more in the prevention of animal diseases than in their actual treatment and cure. Stock owners would require to have their animals inoculated against certain diseases, which was being carried out at the present day. Much more progress and discovery remained to be made, but no inoculations were yet available for special purposes as they ought to be. If support was given by Government grants for such work in this country, as was done in Germany, France, Belgium, America, Canada, and Australia, better progress could be made and many valuable lives of human beings and animals saved. Standardised preparations should be available for the use of medical and veterinary practitioners if preventive medicine was to be a success. All serums, vaccines, and anti-toxins should be used under the control of professional men, otherwise blunders would occur and illness and perhaps deaths be the results of improper treatment and improper diagnosis of diseases.

R.S.P.C.A. Dispensary at Newcastle.

Sir Francis Blake, President, and Mr. Alfred Bonnin, chairman of the Newcastle Branch of the Royal Society for the Prevention of Cruelty to Animals, are issuing an appeal on behalf of the Society to all animal lovers for funds in order to extend the Society's accommodation owing to the increasing demands made upon it.

The dispensary for sick animals of the poor, which is

one of the many activities of the Society, and which was founded in November, 1928, in order to assist *bona fide* poor persons to have their animal pets treated by qualified veterinary surgeons free of charge, thereby eradicating a great deal of cruelty through ignorance and poverty, is in urgent need of funds to cover the cost of drugs, etc.

The dispensary, 19, Vine Lane, Newcastle, is under the direct supervision of the North of England Veterinary Medical Association, the veterinary surgeons giving their services voluntarily for this work.

During the past twelve months 1,035 animal patients have been treated. This charity is dependent solely upon voluntary contributions.

A surgery with proper appliances and instruments is provided, and upon application to the Secretary, R.S.P.C.A., 19, Ridley Place, Newcastle, an inspection can be arranged.—*Newcastle Daily Journal.*

Correspondence.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

Royal Veterinary College Re-building Fund.

To the Editor of the Veterinary Record.

Sir,—I write as one who has digested the unpalatable truth of *The Times* remarks published in your issue of the 4th instant, and who has always considered that if the re-building of the London College were treated by Members more as an urgent family affair and this view acted upon by subscribing accordingly, there would be little need for calling upon outside charitable subscriptions with the attendant mortification of refusal.

As an old student and tutor of the college and a past Fellow of the R.C.V.S., I feel I should be failing in my duty if I did not subscribe my quota, so therefore have great pleasure in enclosing my personal cheque for 100 guineas towards the Fund, which I ask you to be kind enough to forward to the proper quarter, and thank you in anticipation.

Apologising for encroaching on your valuable space and with every good wish for the future prosperity of the Profession and of the dingy but good old College.

I remain,

Yours faithfully, Chas. Peirce.

Animal Hospital,
"The Manor,"
Shirland Road, W.9.
January 6th, 1930.

Uterine Torsion in the Cow.

To the Editor of the Veterinary Record.

Sir,—I have read with interest the letter by my friend, Mr. G. H. Williams, on the above subject, especially the portion where he described his novel method of delivery. I cannot follow him, however, when he has to deal with a case of complete torsion and the fœtus cannot be reached by digital manipulation. I am one of those who have found no difficulty in reducing the twist by rolling. The complex begins, however, after the reduction, and when delivery is attempted.

This, with a moment's consideration, seems obvious. In complete torsion the fœtus cannot reach the pelvis and the labour pains, such as they are, are futile in dilating the passage; consequently in many cases the cow is not really ready for delivery. To attempt delivery, especially in heifers, in those conditions, is courting disaster. For many years I have preferred, if the fœtus is normal, to leave it at that—after reduction—and allow the cow to deliver herself, or pay a second visit if necessary. If there is any deviation from the normal I perform embryotomy. By adopting these simple expedients, I am sure I have saved many a maternal life which would have been lost had immediate drastic traction been adopted.

I am, Sir,
Faithfully Yours,

W. W. Scott, F.R.C.V.S.

Friarn House,
Bridgwater.
December 29th, 1929.

A Case of Operative Treatment of Colic in the Horse.

To the Editor of the Veterinary Record.

Sir,—I thank Mr. Edwards for his letter, but I am sorry to state that I am not yet satisfied, and the matter seems rather important from the author's and clinician's points of view. Looking at the original article I find that the word used is *leinschleim*, which, I hold, means *linseed mucilage* and not *gruel*. I question whether a stomach pump would not get blocked up or work very badly with gruel. The virtues of linseed mucilage are, perhaps, rather overlooked by many present-day practitioners and horse and cattle owners.

Whilst I have my pen in my hand I should like to correct two errors that appear in the *Veterinary Record* for December 21st, 1929. In the discussion on Mr. Stinson's paper on "Post-Parturient Dyspepsia of Bovines," the references to Mr. Hudson's paper on "Retention of the Uterine Fluids" and Mr. Curbishley's article on "Oxaluria" should be to the *Veterinary Journal* and not to the *Veterinary Record*.

Yours faithfully,

G. Mayall.

The Veterinary Surgeon in Fiction.

To the Editor of the Veterinary Record.

Sir,—The interesting notes by Mr. H. C. Wilkie, in your current issue, remind me that the late Principal W. Williams, Edinburgh, who was very fond of telling apt stories and using quotations to add force to the points of his lectures, always used to quote this same dialogue when lecturing on laminitis, navicular disease, and other foot lamenesses, but his version ran thus:—"It 'aint the working 'ard as 'urts the 'orses 'oofs; it's the 'ammer, 'ammer, 'ammer on the 'ard 'igh road."

The Professor emphasised the lesson of the cockney V.S.'s wisdom to point out the dire effects of road concussion, and severely to condemn the then common folly of unduly paring away the frog cushion.

Yours faithfully, Edward P. Edwards
(of Mold).

The Queen,
Bath Road,
Bournemouth.
January 7th, 1930.

The Editor acknowledges receipt of the following:—Communications from Mr. M. K. Garudachar (Edinburgh), and Mr. O. Stinson (Appleby).